

GEVORGIAN, S. et al.
Serial No. 10/781,930

Atty Dkt: 4127-13
Art Unit: 2817

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A tunable resonating arrangement comprising comprising:

a resonator apparatus which provides a two pole filter,
input/output coupling means for coupling electromagnetic energy into/out of the resonator apparatus, and

a tuning device for application of a biasing voltage/electric field to the resonator apparatus,

~~characterized in~~

~~that wherein~~ the resonator apparatus comprises:

a first resonator, and

a second resonator,

~~that wherein~~ said first resonator is non-tunable,

~~that wherein~~ said second resonator is tunable and comprises a ferroelectric substrate,

a ground plane for separating ~~that~~ said first and second resonators are separated by a ~~the~~ ground plane which is being common for said first and second resonators, ~~that~~

~~coupling means are provided for providing coupling between~~ ~~said~~ first and second resonators, and in ~~that~~

wherein for tuning of the resonator apparatus, the biasing voltage/electric field is applied to the second resonator.

2. (Currently Amended) A tunable resonating arrangement according to claim 1,

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~~characterized in~~
~~that wherein~~ the first resonator, is a disk resonator, or a ~~parallel-parallel~~ plate resonator.

3. (Currently Amended) A tunable resonating arrangement according to claim 1,
~~characterized in~~
~~that wherein~~ the second resonator is a disk resonator, or a ~~parallel-parallel~~ plate resonator.

4. (Currently Amended) A tunable resonating arrangement according to claim 2,
~~characterized in~~
~~that wherein~~ the first resonator comprises a dielectric substrate, the electric permittivity of which substantially does not vary with applied biasing voltage, which is disposed between a first resonator first electrode and a first resonator second electrode, and in that the first resonator second electrode of the first resonator forms the ground plane.

5. (Currently Amended) A tunable resonating arrangement according to claim 4,
~~characterized in~~
~~that wherein~~ the dielectric substrate of the first resonator comprises LaAlO_3 , MgO , NdGaO_3 , Al_2O_3 , or sapphire or a material with similar properties.

6. (Currently Amended) A tunable resonating arrangement according to claim 4,
~~characterized in~~
~~that wherein~~ the first resonator has a high quality factor (Q), e.g. and preferably exceeding approximately 10^5 [-] to $5 \cdot 10^5$.

7. (Currently Amended) A tunable resonating arrangement according to claim 4,

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~~characterized in~~

~~that wherein the second resonator comprises a tunable ferroelectric substrate and, a second resonator first electrode, and a second resonator second electrode, and in that the second resonator second electrode of the second resonator forms the common ground plane, and thus the second resonator second electrode is the same as the first resonator second electrode of the first resonator.~~

8. (Currently Amended) A tunable resonating arrangement according to claim 7,

~~characterized in~~

~~that wherein the ferroelectric substrate of the second resonator comprises SrTiO₃, KTaO₃, or BaSTO₃ or a material with similar properties.~~

9. (Currently Amended) A tunable resonating arrangement according to claim 4,

~~characterized in~~

~~that the first and second electrodes, i.e. the first electrodes and the common ground plane, consist of normal, wherein the electrodes comprise a non-superconducting metal, e.g. Au, Ag, Cu.~~

10. (Currently Amended) A tunable resonating arrangement according to claim 4,

~~characterized in~~

~~that the first and second electrodes, i.e. the first electrodes and the common ground plane, consist of wherein the electrodes comprise a superconducting material.~~

11. (Currently Amended) A tunable resonating arrangement according to claim 4,

~~characterized in~~

~~that the first and second electrodes, i.e. the first electrodes and the common ground plane consist of wherein the electrodes comprise a high temperature superconducting material (HTS), e.g. YBCO.~~

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12. (Currently Amended) A tunable resonating arrangement according to claim 1,
~~characterized in~~
~~that wherein upon the application of a tuning (biasing) voltage to said second~~
resonator, electromagnetic energy (EM) ~~will be is~~ redistributed between the second and
first resonators via the coupling means.

13. (Currently Amended) A tunable resonating arrangement according to claim 12,
~~characterized in~~
~~that the wherein the redistribution of electromagnetic energy depends on is a~~
function of the biasing voltage.

14. (Original) A tunable resonating arrangement according to claim 13,
~~characterized in~~
~~that wherein the transfer of electromagnetic energy from the second resonator to~~
the first resonator increases with an increasing biasing voltage.

15. (Currently Amended) A tunable resonating arrangement according to claim 10,
~~characterized in~~
~~that wherein the resonating frequency and the loss tangent of the second resonator~~
increase with the application of an increasing biasing voltage, and ~~in that also wherein~~ the
transfer of electromagnetic energy from the second to the first resonator is increased,
automatically compensating for the increased loss tangent of the second resonator by
reducing the influence thereof on the coupled resonator apparatus.

16. (Original) A tunable resonating arrangement according to claim 1,
~~characterized in~~
~~that wherein the first and second resonators comprise thin film substrates,~~

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17. (Currently Amended) A tunable resonating arrangement according to claim 1,
~~characterized in~~
~~that it comprises further comprising~~ at least two resonator apparatuses, and in that
the common ground plane is common for the at least two resonator apparatuses which
form a tunable filter.

18. (Currently Amended) A tunable resonating arrangement according to claim 1,
~~characterized in~~
~~that wherein~~ the coupling means comprises, for each resonator apparatus, a slot or
an aperture in the common ground plane.

19. (Currently Amended) A tunable resonating arrangement according to claim 1,
~~characterized in~~
~~that wherein~~ each resonator is circular, square shaped, rectangular or ellipsoidal.

20. (Currently Amended) A tunable resonating arrangement according to claim 19,
~~characterized in~~
~~that it comprises wherein the arrangement comprises~~ a dual mode resonator
apparatus, and in that ~~wherein~~ each resonator comprises a protrusion, a cut-out, or a
perturbation to provide for dual mode operation.

21. (Currently Amended) A tunable resonator apparatus,
~~characterized in~~
~~that it comprises comprising:~~
~~a first resonator;~~
~~and a second resonator;~~

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that said first resonator is being non-tunable; that said second resonator is being a tunable ferroelectric resonator, the first resonator and the second resonator forming a two pole filter; that

a ground plane for separating said first and second resonators are separated by a the ground plane which is being common for said first and second resonators, that; coupling means are provided for providing coupling between said first resonator and said second resonators; and

in that wherein for tuning of the resonator apparatus, a biasing voltage is applied to the second resonator.

22. (Currently Amended) A tunable resonator apparatus according to claim 21,

characterized in

that wherein the first resonator and the second resonator comprise parallel-parallel plate resonators, that the common ground plane is formed by a second electrode plate of the first resonator and of a second electrode of the second resonator, and in that wherein the coupling means comprises a slot or an aperture in the common ground plane.

23. (Currently Amended) A tunable resonator apparatus according to claim 22,

characterized in

that wherein the first resonator comprises a substrate, bulk or thin film, comprised of LaAlO₃, MgO, NdGaO₃, Al₂O₃, or sapphire, or a material with similar properties, and in that

wherein the second resonator comprises a substrate, bulk or thin film, comprised of SrTiO₃, or KTaO₃, or a material with similar properties;

wherein the electrode plates comprising comprise normal metal, or [I()] high temperature[()]) superconductors.

24. (Currently Amended) A method of tuning a resonator apparatus,

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~~characterized in~~
~~that it comprises the steps of comprising:~~
[[-]] providing a first, non-tunable, resonator,
[[-]] providing a second tunable resonator,
~~separating such that the first and second resonators are separated by and share a~~
common ground plane,

[[-]] providing coupling means in said common ground plane such that the first and second resonators become coupled, allowing transfer of electromagnetic energy between the first and second resonators,

[[-]] applying a biasing/tuning voltage to said second resonator increasing for changing the resonating frequency, the loss tangent of the second resonator, and the transfer of electromagnetic energy to the first resonator,

[[-]] optimizing the application of the biasing voltage such that the influence of the increased loss tangent in the first resonator, on the coupled resonator apparatus, will be compensated for, by an increased transfer of electromagnetic energy to the first resonator.

25.(original) The method of claim 24,

~~characterized in~~
~~that wherein~~ the first resonator and the second resonator comprise disk or parallel parallel plate resonators, ~~that wherein~~ the common ground plane is formed by a second electrode plate of the first resonator and of a second electrode of the second resonator, and ~~in that wherein~~ the coupling means comprises a slot or an aperture in the common ground plane.

26. (Currently Amended) The method of claim 24,

~~characterized in~~

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~~that wherein the first resonator comprises a substrate, bulk or thin film comprised of LaAlO₃, MgO, NdGaO₃, Al₂O₃, or sapphire, or a material with similar properties, and in that~~

~~wherein the second resonator comprises a substrate, bulk or thin film comprised of SrTiO₃, or KTaO₃, or a material with similar properties,~~

~~wherein the electrode plates comprising comprise normal metal, or [[()]]high temperature[D]] superconductors.~~

27. (Currently Amended) The method of claim 2426,

~~characterized in~~

~~that it comprises the step of further comprising:~~

~~[-] coupling two or more resonator apparatuses such that a filter is provided,~~

~~[-] optimizing the coupling between the respective first and second resonator~~

~~such that the increasing loss factor produced by an increased biasing voltage, in the ferroelectric substrates, can beis reduced.~~

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